This document contains excerpts from the X-34 Independent Assessment Report (title page shown below). Only those sections which relate to the PBMA element **Software Design** are displayed.

The complete report is available through the PBMA web site, Program Profile tab.

X-34

Safety & Mission Assurance Review

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Office of Safety & Mission Assurance

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3.1.5 Configuration and Data Management

Software Control

The X-34 program uses Polymake Version Control System (PVCS), an off-the-shelf CM tool for software configuration control. This tool controls software at the module level as well as the vehicle level. For each module in the X-34 program, an archive is maintained which tracks modifications to the module. Any past revision can be re-created at any time since the revision history and changes are stored by PVCS. The software librarian has privileges to write a new version into the library. All changes are monitored by the X-34 software configuration management officer.

At the vehicle level, a version label is assigned to a set of specific revisions of vehicle software modules. Once a version label is assigned, this set of specific modules may be re-created at any time.

Software modification can be driven by changes to any of the following:

- mission specific or functional requirements (as defined in the Mission Requirements Document)
- system/segment specifications
- problems found in the field or during testing

3.2.7 Software Design and Verification

The philosophical approach to X-34 software development is to develop a very simple set of software modules to control the vehicle during discrete modes of operation. This software is almost entirely of flight proven heritage from the Space Shuttle, Pegasus, and Taurus programs. Software is designed and managed by two separate groups. The guidance, navigation and control (GN&C) team is responsible for all navigation and stability control software. The avionics team handles all non-GN&C-related software.

The X-34 does not employ any specific Mil-Standard or NASA Standard related to software development or independent verification and validation (IV&V). The X-34 program does not have a separate group under contract to provide software IV&V, (nor did the contract include funding for software IV&V.) However it is important to note that much of the X-34 software has a heritage which involved extensive IV&V, namely the Pegasus and Space Shuttle programs. The re-entry and landing is 100% Shuttle heritage. In the case of software under development by Draper Labs, OSC will, in-effect, verify the software through extensive integrated hardware/software testing. It should also be noted that traditional IV&V involves testing at the sub-routine level ("to break the code") and at each successive level of software integration. OSC is not testing down at the sub-routine level but rather focusing on the fidelity of higher level code.